

# Full mouth rehabilitation of a patient with mandibular implant screw retained Fp-3 prosthesis opposing maxillary acrylic removable over-denture

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## Abstract

A hybrid denture is one that is fabricated over a metal framework and retained by screws threaded into the implant abutments. The anterior part of a mandibular hybrid denture is fixed on implants while the posterior part of the denture is extended and cantilevered from implants. This article presents the fabrication of a maxillary over-denture opposing mandibular implant retained hybrid prosthesis. A total of four implants were placed in the mandibular arch. Castable abutments were used to produce the optimal angulations. Framework was waxed, cast recovered, and the fit was refined until the framework seated passively on the master cast. The mandibular denture teeth were waxed to the hybrid framework, and a final wax try-in was performed to verify and correct maxillomandibular relations before processing. The prosthesis was inserted after verification of occlusion, retention, and stability. The rehabilitation of edentulous patients with hybrid dentures has been observed to achieve greater masticatory function and psychological satisfaction than with conventional over-dentures. Producing a passive-fitting substructure for a fixed removable screw retained hybrid prosthesis is arguably one of the most technically complex tasks in implant dentistry. The technique presented may not initially produce a perfectly passive framework, but use of disclosing media and adjusting the internal aspect of the casting can result in non-binding, fully seated prostheses.

**Keywords:** Hybrid prosthesis, implant occlusion, passive fit

## Introduction

Mandibular implant-supported hybrid prostheses have been used for edentulous patients who could not adapt to long-term use of conventional complete dentures. A hybrid denture is one that is fabricated over a metal framework and retained by screws threaded into the implant abutments. The anterior part of a mandibular hybrid denture is fixed on implants while the posterior part of the denture is extended and cantilevered from implants. Unfavorable occlusal loading on the extension has been reported to cause loosening and breakage of screws and prosthetic posts, framework fracture,

and implant loss. Loading is determined primarily by the length of the lever arms and distal extensions.<sup>[1]</sup> It has been suggested that the extension from the midpoint of the most distal implant must not exceed 15 mm in the mandible. Others believe that the distal extension must not go beyond the first molars. Therefore, the hybrid denture often has fewer posterior teeth than a conventional complete denture, and the distribution of occlusal loads in the hybrid denture may be different from those in the conventional denture.<sup>[2]</sup>

Finger and Guerra proposed that when implants are placed in one arch there is the possibility of rendering an opposing complete denture unstable. Zarb and Schmitt<sup>[3]</sup> suggested that the imbalance in stress resolution may lead to rapid resorption of the alveolar ridge in the maxillary arch. However, there is a little quantitative analysis on the distribution of occlusal loads and the stability of a maxillary denture opposed by a hybrid denture.

## Aim

This article presents the fabrication of a maxillary over-denture opposing mandibular implant retained hybrid prosthesis.

## Case Report

A 52-year-old white woman was initially seen with an existing maxillary tooth supported over-denture opposing edentulous mandibular arch [Figure 1]. The patient had initiated treatment previously with a general dentist, but decided to seek specialty care for the completion of her treatment. Fabrication of screw retained hybrid prosthesis was planned

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for the mandibular arch and a new over-denture for maxillary arch. The unfavorable sinus anatomy in the posterior maxilla and patient's unwillingness for bone grafting to facilitate implant placement precluded the placement of implants in the maxillary arch [Figure 2]. The treatment options presented to the patient also included the fabrication of an implant-supported over-denture, but the patient's desire was to eliminate a removable prosthesis in the mandible. The following clinical and laboratory procedures were performed.

### Stage I implant surgery

A full thickness mucoperiosteal flap was raised in the mandibular arch from distal to mental foramen on one side to mental foramen on the other side. In the right quadrant, implants (Tapered self-thread, Hi-Tech Implants, and Life care implant system) were placed in the 2<sup>nd</sup> premolar (4.2 mm × 10 mm), lateral incisor (4.2 mm × 10 mm) regions. In the left quadrant, implants were placed in 2<sup>nd</sup> premolar (4.2 mm × 10 mm), lateral incisor (4.2 mm × 10 mm) and regions. The implant dimensions were selected with the help of a computed tomography scan and 3D reconstructive image [Figure 3]. A total of four implants were placed in the mandibular arch with a help of surgical stent. The flap was closed using the horizontal interrupted sutures. After 1 week, the sutures were removed and an immediate denture was relined with a permanent soft denture liner (Permasoft, Dentsply, York, PA, USA) and inserted.

### Stage II implant surgery

After a waiting period of 4 months, an (Orthopantomograph 10E, Siemens) OPG was obtained to evaluate the bone to implant contact percentage [Figure 4] and later stage II surgery was performed under local anesthesia cover screws were exposed and healing abutments were placed and the flap sutured.

### Prosthetic phase

Maxillary and mandibular arch impressions were made using alginate (Tulip Alginate Impression Material, Cavex, Holland Bv, Haarlem, Holland). A conventional special tray was fabricated for the maxillary arch and a custom open tray was fabricated in acrylic resin (Autopolymerizing acrylic resin, ALIKE™; GC America, ALSIP, USA) for the mandibular arch. The open tray was verified in the patient's mouth. After 1 week, the healing abutments were removed, and impression copings were connected to the implants (Impression Coping

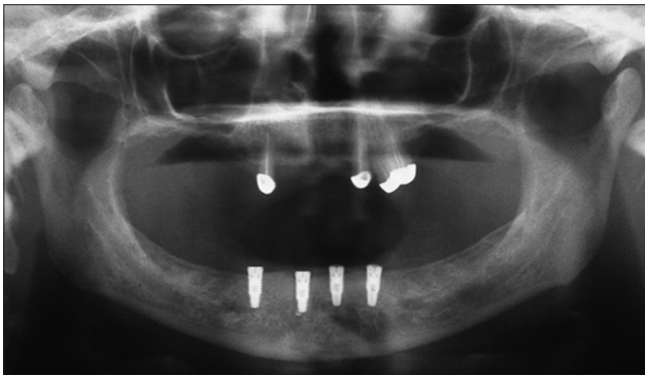
Pick-up Type, 4 mm Profile; 3i Implant Innovations, Palm Beach Gardens, Fla.). These open tray impressions copings were stabilized with 23 gauge ortho wire and blocked out with acrylic resin (Autopolymerizing acrylic resin, ALIKE™; GC America, ALSIP, USA). The mandibular impression was made with monophase polyvinyl siloxane impression material (Aquasil Lv Ultra, Smart Wetting Impression Material, Dentsply, Detrey GmbH, Konstanz, Germany). Border molding was completed with green stick compound and secondary impression was made using addition silicone impression material (Aquasil Lv Ultra, Smart Wetting Impression Material, Dentsply, Detrey GmbH, Konstanz, Germany) for the maxillary arch. The impressions were poured in die stone (Ultrarock, Kalabhai Karson Pvt. Ltd., Mumbai, India) Master casts were recovered and trimmed and record bases and occlusion rims were fabricated. Patient returned for recording of maxillomandibular relations and tooth selection. Master casts were then mounted on a semiadjustable articulator (Hanau Modular Articulator System, Waterpik Technologies Inc., Fort Collins, Colo.). The path of insertion deviated considerably, so castable abutments were used to produce the optimal angulations. Wax up for framework fabrication was carried out. The framework was waxed, cast, recovered, and fitted on the master cast. Disclosing media (Kerr's Disclosing Wax; Kerr, Romulus, Mich. and Occlude; Pascal Co Inc., Bellevue, Wash.) were used to evaluate the fit of the framework and to guide adjustment procedures. The fit was refined until the framework seated passively on the master cast. The metal framework was tried in to evaluate and verify a passive fit intra-orally [Figure 5]. Disclosing media was used to discern any fit discrepancies. Adjustments were performed, and abutments were removed from the implant fixtures and healing abutments reconnected. The mandibular denture teeth were waxed to the hybrid framework, and a final wax try-in was performed to verify and correct maxillomandibular relations. At this appointment, the customized abutments along with the framework were connected to the implants for the final wax try-in. At this time an OPG was made to evaluate the fit between frameworks and implant interface [Figure 6]. The maxillary tooth supported over-denture was invested/flashed and processed by use of the maxillary master cast as any conventional complete denture. However, the mandibular hybrid prosthesis was invested without the master cast. The internal aspects of the casting that fit on the abutments were blocked out with the polyvinyl-siloxane impression material,



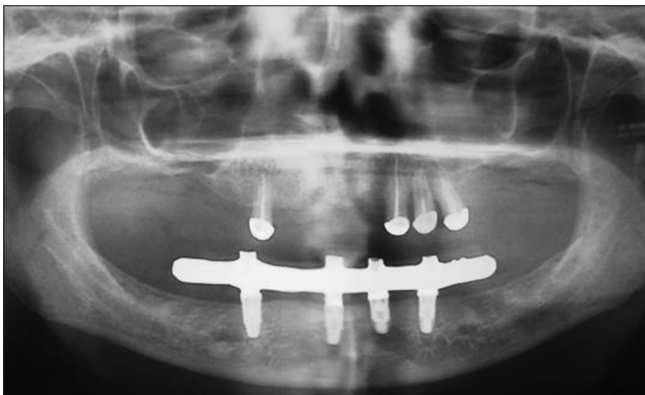
**Figure 1:** Pre-operative photograph



**Figure 2:** OPG (Orthopantomograph) with radiographic markers in place



**Figure 4:** Radiograph after 6 months of implant placement

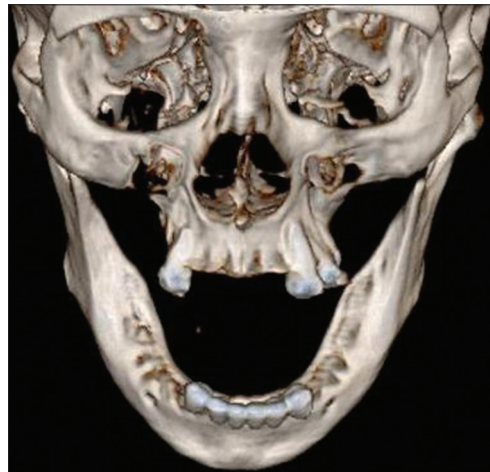


**Figure 6:** OPG after framework placement

and the prosthesis was invested directly into the lower half of the processing flask. The investing, flasking, and processing procedures were then completed. The prostheses were finished and polished, a clinical remount was performed to allow for refinement of occlusal contacts, the hybrid prosthesis was screw retained and provisional cement (Temp Bond; Kerr) was used to cover screw access hole. Maxillary over-denture and Mandibular hybrid prosthesis were inserted [Figure 7]. Hygiene techniques were reviewed, and patient was scheduled for recall and maintenance.

#### Occlusion and articulation

Occlusion was evaluated using guided closure and was



**Figure 3:** Computed tomography scan to determine the width and height of bone



**Figure 5:** Framework trial intra-orally

considered as: Good, if centric relation (CR) coincided with centric occlusion (CO); moderate, if minor ( $<0.5$  mm) deviation was observed between CR and CO; poor, if clear ( $>0.5$  mm) deviation was observed between CR and CO. Articulation was considered as good when it was fully balanced during lateral movements performed from CO, otherwise it was considered poor. Presence or absence of frontal contact in CO was also noted.<sup>[4,5]</sup>

#### Retention and stability

Retention of the maxillary tooth supported over-denture was examined using the following scores: (1) good = good resistance to vertical pull, and sufficient resistance to lateral forces; (2) satisfactory = slight to moderate resistance to vertical pull, and little or no resistance to lateral forces; and (3) poor = no resistance to vertical pull and lateral forces; the denture falls out of place. Stability was determined with the following criteria: (1) good = slight or no rocking on denture-supporting structures when under pressure; (2) moderate = moderate rocking on supporting structures under pressure; and (3) poor = extreme rocking on supporting structures under pressure.<sup>[6,7]</sup>

#### Discussion

Jacobs *et al.*<sup>[8]</sup> found greater annual maxillary bone resorption in patients with mandibular implant supported fixed prostheses than in patients with mandibular over-dentures supported by two implants. A maxillary complete denture





**Figure 7:** (a) Maxillary and mandibular prosthesis in place. (b) Maxillary occlusal view. (c) Mandibular occlusal view

occluding with a hybrid denture has also been said to increase vulnerability to midline fracture. Based on these findings, it is recommended that the stability and retention of a maxillary denture be checked more often and the occlusion adjusted more frequently to relieve anterior tilting for the hybrid denture wearer.

Producing a passive-fitting substructure for fixed removable screw retained hybrid prosthesis is arguably one of the most technically complex tasks in implant dentistry. In spite of a number of techniques to prevent or correct distortions that occur during impression making, cast pouring, waxing, casting, indexing, and soldering, errors in the fit of frameworks persist.<sup>[9]</sup> The gap between an implant fixture and an abutment should be 10  $\mu$ m or less to be considered passive.<sup>[10]</sup> This degree of fit may be almost impossible with the geometry of most screw-retained fixed detachable hybrid prostheses. The technique presented may not initially produce a perfectly passive framework, but use of disclosing media and adjusting the internal aspect of the casting can result in non-binding, fully seated prostheses. Disclosing media were used to evaluate the fit of the framework on the implant abutments in the same manner as are used to ensure complete seating and passivity for conventional fixed and removable partial dentures. Adjustments to the internal surfaces of the framework can then be made to eliminate binding as in conventional prostheses. Although the possibility exists that sectioning, indexing, and soldering may be required to obtain a passive-fitting substructure of this design, modification of the internal aspects should be sufficient in the majority of situations. There may be several disadvantages of this technique. First, selection, and milling of modification (preparable) abutments requires an experienced clinician and technician working together with adequate communication. Implant angulations beyond 15 degrees may require an angled abutment or a castable abutment to achieve an acceptable path of insertion. Furthermore, numbering or other methods of matching the correct abutment and orientation with the correct implant fixture is imperative. Patients with limited inter-arch space may present several

problems. It may result in a framework with deficient thickness or insufficient space for setting denture teeth.

The rehabilitation of edentulous patients with hybrid dentures has been observed to achieve greater masticatory function and psychological satisfaction than with conventional over-dentures.<sup>[11]</sup> Occlusal forces have been increased considerably following the placement of an implant-supported prosthesis. Many investigators have studied occlusal force measurements in patients with implant-supported prostheses opposing complete maxillary dentures, but their force measurements vary significantly.<sup>[12]</sup>

#### Clinical significance

Producing a passive-fitting substructure for fixed removable screw retained hybrid prosthesis is arguably one of the most technically complex tasks in implant dentistry. The technique presented may not initially produce a perfectly passive framework, but use of disclosing media and adjusting the internal aspect of the casting can result in non-binding, fully seated prostheses. To preserve maxillary bone, a balanced occlusal concept has been recommended for implant-retained mandibular hybrid prostheses opposing a tooth supported maxillary over-denture.<sup>[10]</sup> In this case, the patient was rehabilitated with a balanced occlusion without anterior tooth contact in maximal intercuspation. If anterior contact was noticed during the annual recall examination, the occlusion was adjusted to relieve the pressure from the anterior maxilla.

#### Conclusion

Every patient has unique treatment needs. Proper diagnosis and treatment plan are important but cannot be all-inclusive. A comprehensive examination, including a thorough medical and dental history, orofacial and dental clinical examination, dental radiographs, impressions, and jaw relation records for mounting casts are important steps leading to a successful oral rehabilitation. Careful integration and sequencing of the different areas of treatment needed, enhances the final result. Dentists must consider the advantages and

disadvantages the available implant prosthetic options and match them to patient's expectations. This article reports on the fabrication of a maxillary over-denture opposing a mandibular implant-Screw retained hybrid prosthesis. Occlusion and articulation were found to be good over a period of 2 years. Retention and stability were found to be good up till the 18 month review and moderate at the 24 month review.

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